SUPPLEMENTARY INFORMATION

Supplementary Table 1: Results from PMR report

Input parameter			Input value
Cost inputs	Infrastructure costs for BaS scale-up (small scale facilities)	Facility capacity (number of BaS per year)	150.00
		Cost of setting up a facility	£2,500,000.00
		Time required for setting up a facility (in years)	1.00
		Time required for the facility to be fully functional (in years)	0.00
	Infrastructure costs for BaS scale-up (large scale facilities)	Facility capacity (number of BaS per year)	500.00
		Cost of setting up a facility	£7,500,000.00
		Time required for setting up a facility (in years)	3.00
		Time required for the facility to be fully functional (in years)	0.00
		Number of BaS per year (facility capacity)	500.00
Capacity inputs	Current annual capacity (number of BaS)	NHS	7,011
		Private sector	15,000
	Maximum potential annual capacity	NHS	7,888
		Private sector	18,750
	BaS distribution by procedure type (for scale-up strategy)	Gastric band	0.00%
		Sleeve gastrectomy	50.00%
		Gastric bypass	50.00%
Eligibility assessment stage	Number of personnel visits	GP	1.00
		Psychologist	1.50
		Dietitian	1.00
		Endocrinologist	1.00
		Physiotherapist	1.00
	Personnel time per visit (in mins)	GP	30.00
		Psychologist	60.00
		Dietitian	30.00
		Endocrinologist	30.00
		Physiotherapist	45.00

	Proportion of population requiring personnel visits/monitoring	GP	100.00%
		Psychologist	100.00%
		Dietitian	100.00%
		Endocrinologist	80.00%
		Physiotherapist	100.00%
		Blood test	100.00%
		ECG	100.00%
Pre-BaS stage	Personnel time per visit (in mins)	Surgeon	30.00
		Dietitian	45.00
		Anaesthetist	30.00
Post-BaS follow-up	Follow-up visits (up to 24 months post-BaS)	Nurse	4.00
		Surgeon	1.00
		Dietitian	3.00
		GP	0.00
	Follow-up visits (24 to 48 months post-BaS)	Nurse	0.00
		Surgeon	0.00
		Dietitian	0.00
		GP	4.00
	Personnel time per visit (in mins)	Nurse	10.00
		Surgeon	10.00
		Dietitian	10.00
		GP	10.00
Resource utilisation	Number of working hours per personnel (annual)	(GP, psychologist, dietitian, endocrinologist, physiotherapist, surgeon, anaesthetist, registrar surgery, registrar/trainee anaesthesiology, operating department practitioner, healthcare assistant/healthcare service worker, nurse)	2160 each*
	Proportion of time spent on BaS (Current scenario)	(GP, psychologist, dietitian, endocrinologist, physiotherapist, surgeon, anaesthetist, registrar surgery, registrar/trainee anaesthesiology, operating department practitioner, healthcare assistant/healthcare service worker, nurse)	50% each
	Proportion of time spent on BaS for new personnel added in scale-up scenario	(GP, psychologist, dietitian, endocrinologist, physiotherapist, surgeon, anaesthetist, registrar surgery, registrar/trainee anaesthesiology, operating department practitioner, healthcare assistant/healthcare service worker, nurse)	100% each

*based on 48-hour work week for 45 weeks per year.
BaS, bariatric surgery; ECG, electrocardiogram; GP, general physician; PMR, primary market research

Supplementary Table 2: Complication rates

Short-term complications (30 days)				**Source**
Complication rate (proportion of patient population)	**Gastric band**	**Sleeve gastrectomy**	**Gastric bypass**	(36)
Bleed	0.00%	13.00%	18.90%	
Obstruction	0.00%	0.00%	8.70%	
Leak	7.40%	0.00%	6.60%	
Revision surgery	2.20%	0.20%	1.30%	
Long-term complications				(31)
Complication rate (proportion of patient population)	**Gastric band**	**Sleeve gastrectomy**	**Gastric bypass**	
Cholecystectomy, 1-year	1.00%	0.00%	1.55%	
Cholecystectomy, 2-year	0.00%	0.00%	1.93%	
Abdominal wall hernia operations, 1-year	0.50%	1.90%	0.88%	
Abdominal wall hernia operations, 2-year	3.10%	0.00%	1.22%	
Banding operations, 1-year	0.00%	0.00%	3.60%	
Banding operations, 2-year	0.00%	0.00%	7.10%	
Plastic operations, 1-year	0.00%	0.00%	0.41%	
Plastic operations, 2-year	0.80%	6.30%	5.04%	
Leakage and abscess, 1-year	0.00%	0.19%	0.19%	
Leakage and abscess, 2-year	0.00%	0.14%	0.14%	
Obstruction, 1-year	0.00%	1.74%	1.74%	
Obstruction, 2-year	0.00%	3.31%	3.31%	
Stricture, 1-year	0.00%	0.22%	0.22%	
Stricture, 2-year	0.00%	0.11%	0.11%	
Gastric ulcer, 1-year	1.05%	1.05%	1.05%	
Gastric ulcer, 2-year	0.95%	0.95%	0.95%	
Cholecystectomy 1-year, revision surgery	1.40%	1.40%	1.40%	
Cholecystectomy 2-year, revision surgery	0.70%	0.70%	0.70%	
Hernia operations 1-year, revision surgery	4.55%	4.55%	4.55%	
Hernia operations 2-year, revision surgery	5.18%	5.18%	5.18%	
Plastic operations 1-year, revision surgery	1.30%	1.30%	1.30%	
Plastic operations 2-year, revision surgery	3.40%	3.40%	3.40%	
Other complications 1-year, revision surgery	7.40%	7.40%	7.40%	
Other complications 2-year, revision surgery	5.50%	5.50%	5.50%	

Supplementary Table 3: Healthcare resource utilisation

Input	Source
Eligibility assessment stage*	
Number of personnel visits	Expert inputs**, (31)
Personnel time per visit (in mins)	Expert inputs**
Monitoring frequency (blood test, ECG)	(31)
Proportion of population requiring personnel visits/monitoring	Expert inputs**, (31)
Pre-BaS stage*	
Number of personnel visits	(31)
Personnel time per visit (in mins)	Expert inputs**
Proportion of population requiring personnel	(31)
BaS procedure	
Time spent (in mins)–gastric band/sleeve gastrectomy/ gastric bypass (surgeon, registrar surgery, anaesthetist, registrar / trainee anaesthesiology, nurses, operating department practitioner, healthcare assistant/healthcare service worker, operation theatre)	(40)
Hospital stays (number of days) (gastric band, sleeve gastrectomy, gastric bypass)	(31)
Post-BaS follow-up*	
Follow-up visits (up to 24 months post-BaS, 24 to 48 months post-BaS)	Expert inputs**, (31)
Personnel time per visit (in mins)	Assumption, validated through PMR QoL interviews Mar 2023**
Resource utilisation	
Number of working hours per personnel (annual) (GP, psychologist, dietitian, endocrinologist, physiotherapist, surgeon, anaesthetist, registrar surgery, registrar/trainee anaesthesiology, operating department practitioner, healthcare assistant/healthcare service worker, nurse)	Assumption (based on 48–hour work week for 45 weeks per year)**
Proportion of time spent on BaS (current scenario) (GP, psychologist, dietitian, endocrinologist, physiotherapist, surgeon, anaesthetist, registrar surgery, registrar/trainee anaesthesiology, operating department practitioner, healthcare assistant/healthcare service worker, nurse)	Assumption**
Proportion of time spent on BaS for new personnel added in scale-up scenario (GP, psychologist, dietitian, endocrinologist, physiotherapist, surgeon, anaesthetist, registrar surgery, registrar/trainee anaesthesiology, operating department practitioner, healthcare assistant/healthcare service worker, nurse)	Assumption**

*Refer to Figure 1 for information on the personnel involved.
**Data from PMR report are described in Supplementary Table 1.
BaS, bariatric surgery; ECG, electrocardiogram; GP, general physician; PMR, primary market research

Supplementary Table 4: Base-case results for scenario of maximising current NHS capacity

	Current scenario	Projected scenario	Incremental
Number of BaS procedures (n)			
Gastric band	15,889	4,915	-10,974
Sleeve gastrectomy	72,949	78,707	5,758
Gastric bypass	48,909	71,271	22,362
Total	**137,746**	**154,893**	**17,147**
Revision surgery–Gastric band	406	126	-280
Revision surgery–Sleeve gastrectomy	719	776	57
Revision surgery–Gastric bypass	1,349	1,965	617
Total	**2,474**	**2,867**	**393**
Cost breakdown			
Infrastructure costs of BaS scale-up	£0	£0	£0
Procedure costs	£1,309,959,040	£1,548,177,028	£238,217,988
Gastric band	£83,421,834	£25,804,911	-£57,616,922
Sleeve gastrectomy	£700,438,431	£755,730,103	£55,291,672
Gastric bypass	£526,098,776	£766,642,014	£240,543,238
Revision surgery–Gastric band	£295,652	£91,454	-£204,198
Revision surgery–Sleeve gastrectomy	£3,010,012	£3,247,618	£237,606
Revision surgery–Gastric bypass	£3,741,914	£5,452,794	£1,710,880
Revision surgery costs	£7,047,578	£8,791,867	£1,744,289
Personnel costs–Post-BaS follow-up	**£27,195,369**	**£30,581,267**	**£3,385,898**
Complication costs	£66,810,472	£86,349,765	£19,539,294
Gastric band	£4,330,778	£1,339,642	-£2,991,137
Sleeve gastrectomy	£15,957,875	£17,217,568	£1,259,693
Gastric bypass	£46,521,818	£67,792,555	£21,270,737
Total–20 years	**£1,411,012,459**	**£1,673,899,928**	**£262,887,469**
Total–Annual	**£70,550,623**	**£83,694,996**	**£13,144,373**

BaS, bariatric surgery

Supplementary Table 5: Base-case results for scenario of maximising current NHS and private sector capacity

	Current scenario	Projected scenario	Incremental
Number of BaS procedures (n)			
Gastric band	15,889	7,251	-8,637
Sleeve gastrectomy	72,949	116,125	43,176
Gastric bypass	48,909	105,154	56,245
Total	**137,746**	**228,531**	**90,784**
Revision surgery - Gastric band	406	185	-221
Revision surgery - Sleeve gastrectomy	719	1,145	426
Revision surgery - Gastric bypass	1,349	2,899	1,551
Total	**2,474**	**4,229**	**1,756**
Cost breakdown			
Infrastructure costs of BaS scale-up	£0	£0	£0
Procedure costs	£1,309,959,040	£2,284,189,181	£974,230,140
Gastric band	£83,421,834	£38,072,713	-£45,349,121
Sleeve gastrectomy	£700,438,431	£1,115,008,486	£414,570,055
Gastric bypass	£526,098,776	£1,131,107,982	£605,009,206
Revision surgery–Gastric band	£295,652	£134,932	-£160,720
Revision surgery–Sleeve gastrectomy	£3,010,012	£4,791,554	£1,781,543
Revision surgery–Gastric bypass	£3,741,914	£8,045,084	£4,303,170
Revision surgery costs	£7,047,578	£12,971,570	£5,923,992
Personnel costs–Post-BaS follow-up	£27,195,369	£45,119,775	£17,924,406
Complication costs	£66,810,472	£127,400,934	£60,590,462
Gastric band	£4,330,778	£1,976,515	-£2,354,264
Sleeve gastrectomy	£15,957,875	£25,402,898	£9,445,023
Gastric bypass	£46,521,818	£100,021,521	£53,499,703
Total–20 years	£1,411,012,459	£2,469,681,460	£1,058,669,001
Total–Annual	£70,550,623	£123,484,073	£52,933,450

BaS, bariatric surgery

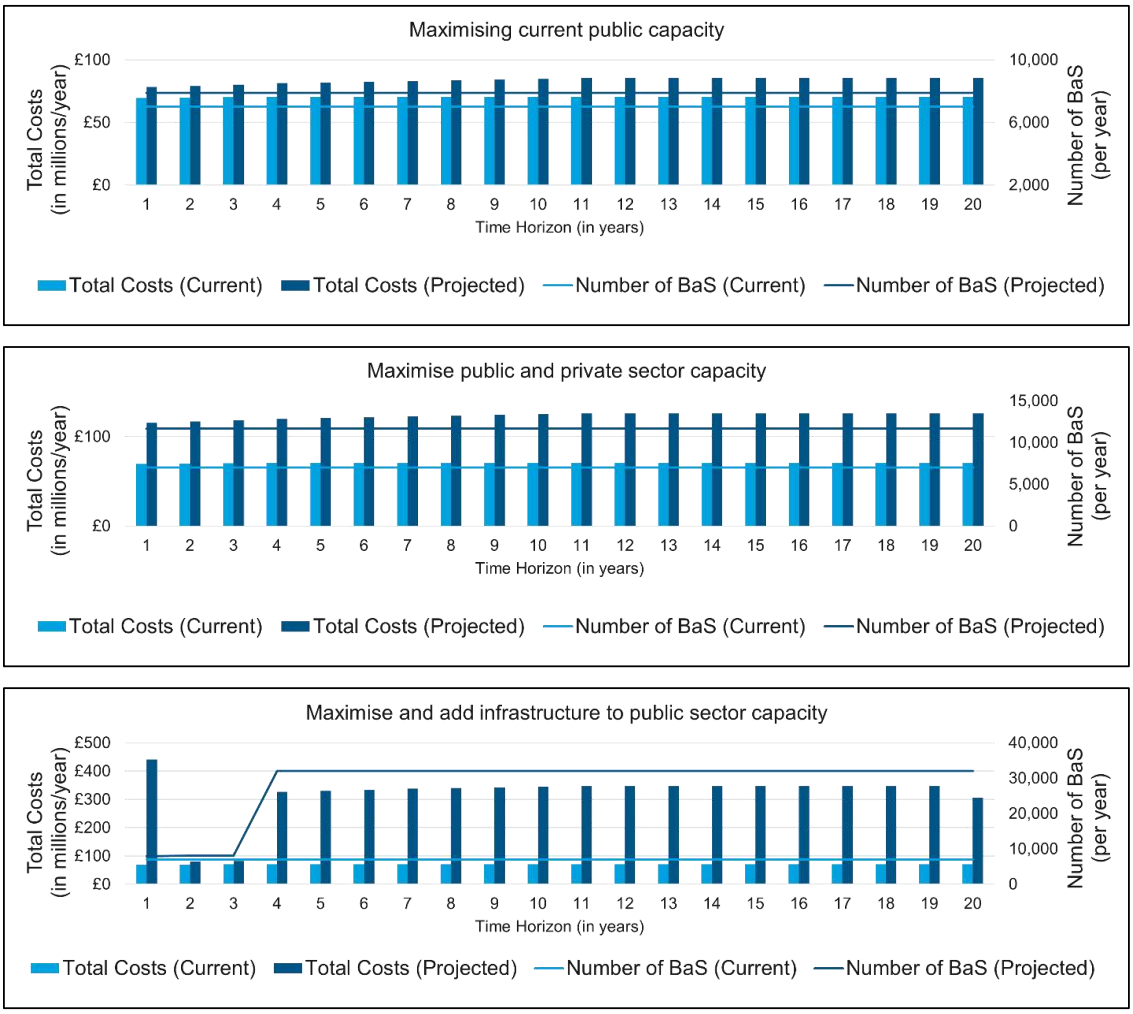
Supplementary Table 6: Base-case results for scenario of maximising current NHS capacity and adding the infrastructure

	Current scenario	Projected scenario	Incremental
Number of BaS procedures (n)			
Gastric band	15,889	12,603	-3,286
Sleeve gastrectomy	72,949	280,477	207,528
Gastric bypass	48,909	261,408	212,499

Total	**137,746**	**554,489**	**416,742**
Revision surgery–Gastric band	406	322	-84
Revision surgery–Sleeve gastrectomy	719	2,765	2,046
Revision surgery–Gastric bypass	1,349	7,207	5,859
Total	**2,474**	**10,295**	**7,821**
Cost breakdown			
Infrastructure costs of BaS scale-up	**£0**	**£362,500,000**	**£362,500,000**
Procedure costs	**£1,309,959,040**	**£5,571,136,652**	**£4,261,177,612**
Gastric band	£83,421,834	£66,171,160	-£17,250,674
Sleeve gastrectomy	£700,438,431	£2,693,074,993	£1,992,636,562
Gastric bypass	£526,098,776	£2,811,890,500	£2,285,791,723
Revision surgery–Gastric band	£295,652	£234,514	-£61,137
Revision surgery–Sleeve gastrectomy	£3,010,012	£11,573,020	£8,563,008
Revision surgery–Gastric bypass	£3,741,914	£19,999,766	£16,257,852
Revision surgery costs	£7,047,578	£31,807,300	£24,759,722
Personnel costs–Post-BaS follow-up	**£27,195,369**	**£108,792,968**	**£81,597,599**
Complication costs	**£66,810,472**	**£313,440,345**	**£246,629,873**
Gastric band	£4,330,778	£3,435,223	-£895,555
Sleeve gastrectomy	£15,957,875	£61,355,506	£45,397,631
Gastric bypass	£46,521,818	£248,649,616	£202,127,798
Total–20 years	**£1,411,012,459**	**£6,387,677,265**	**£4,976,664,806**
Total–Annual	**£70,550,623**	**£319,383,863**	**£248,833,240**
Number of personnel required			
GP	139	337	198
Mental health professional	192	469	277
Dietitian	222	544	322
Endocrinologist	52	126	74
Physiotherapist	96	235	139
Surgeon	265	668	403
Anaesthetist	275	693	418
Registrar surgery	192	494	302
Registrar/Trainee anaesthesiology	197	523	326
Operating department practitioner	218	552	334
Healthcare assistant/Healthcare service worker	371	953	582
Nurse	464	1170	706
Total	**2683**	**6764**	**4081**

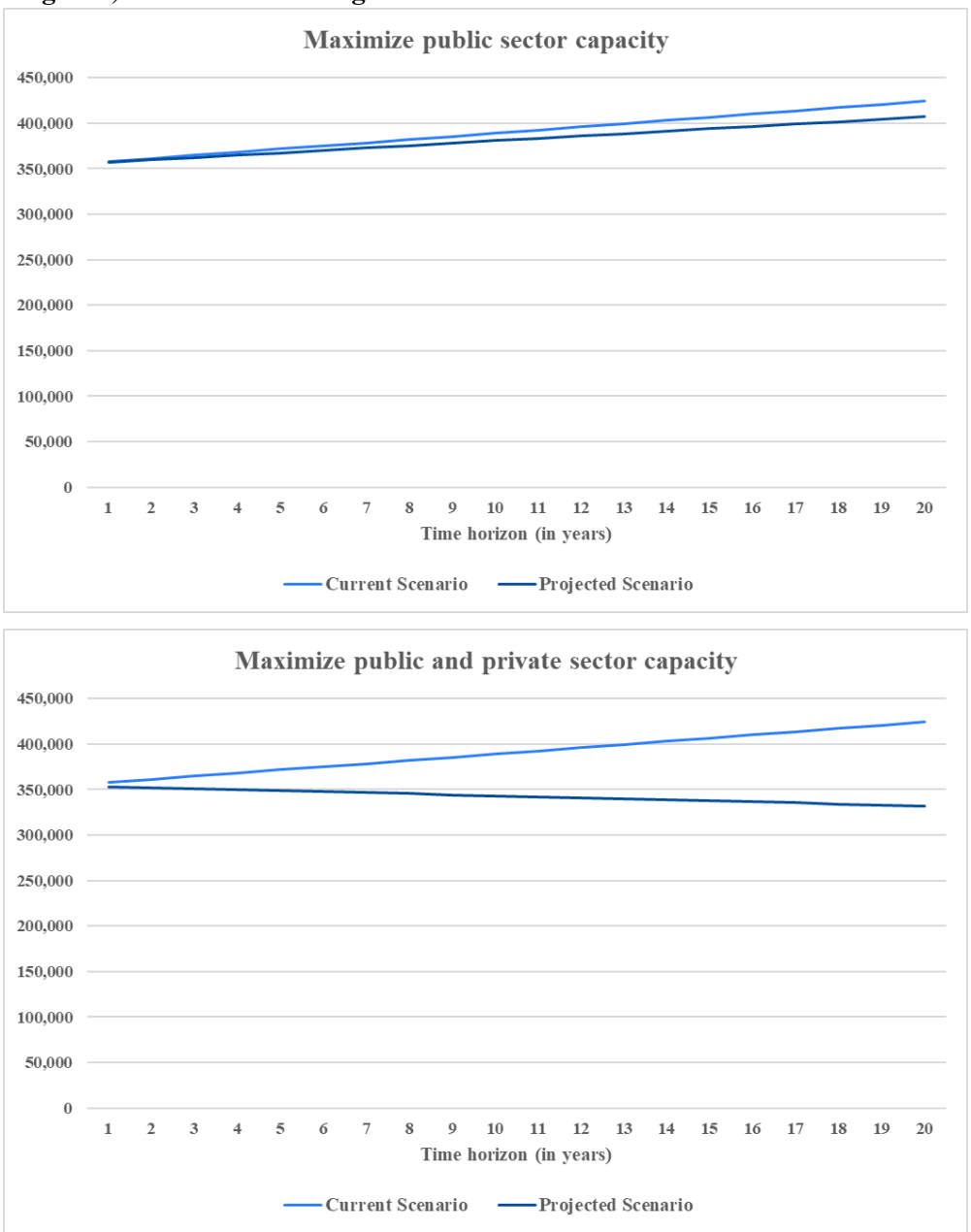
BaS, bariatric surgery, GP, general physician

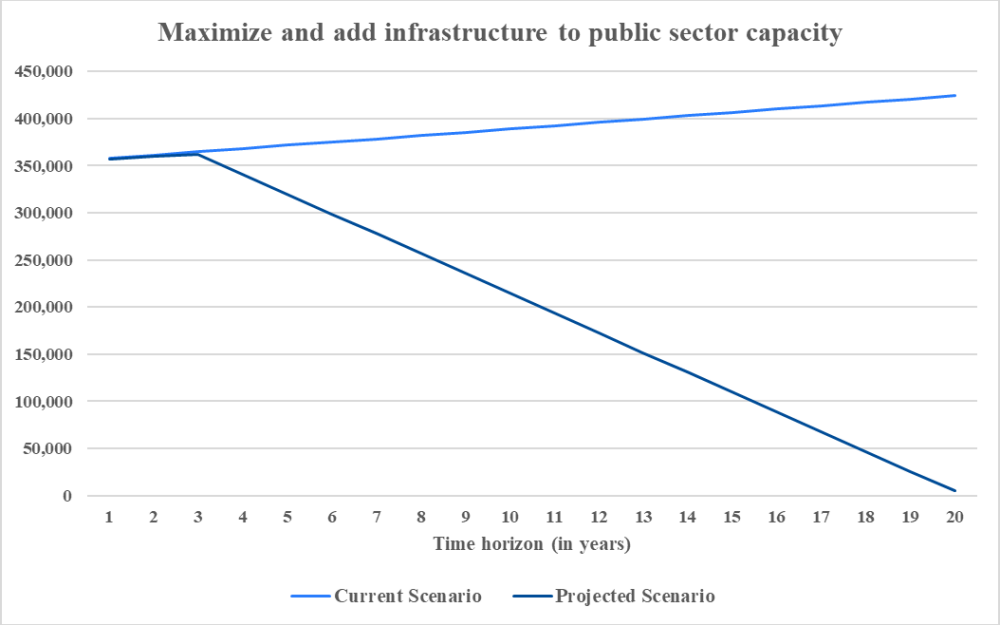
Supplementary Figure 1: Cost versus capacity over time for the three strategies



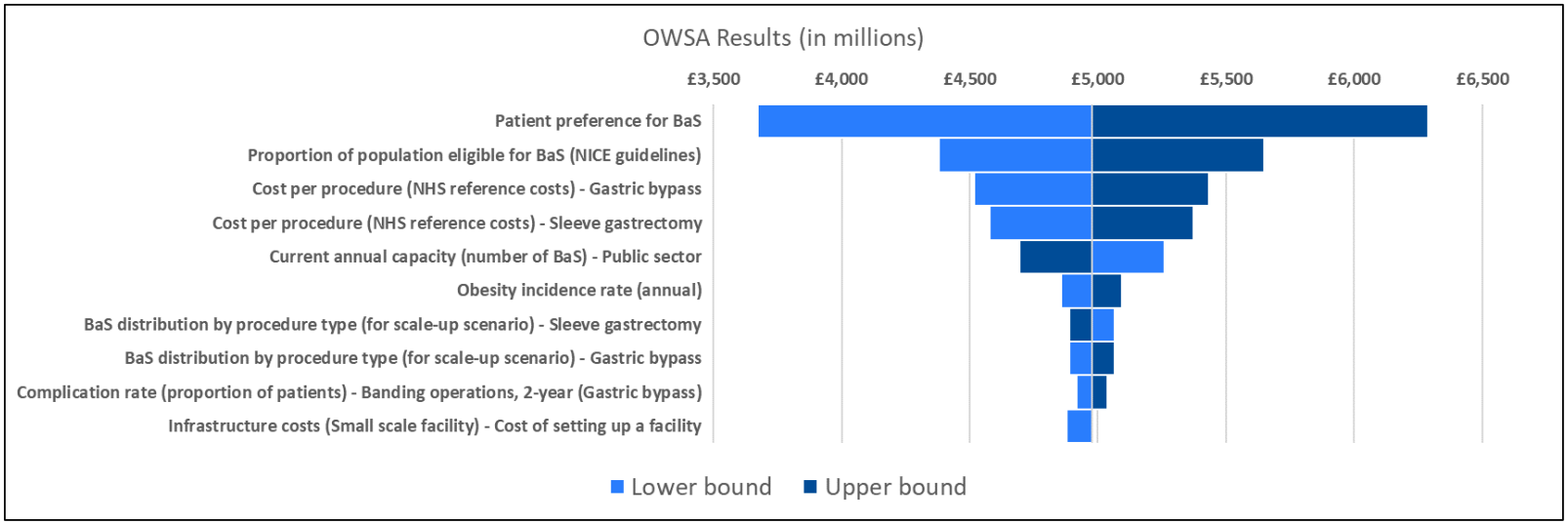
BaS, bariatric surgery

Supplementary Figure 2: BaS Backlog (number of BaS needed including revision surgeries) for the three strategies




Maximize and add infrastructure to public sector capacity
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Time horizon (in years)
Current Scenario
Projected Scenario

Supplementary Figure 3: One-way sensitivity analysis



BaS, bariatric surgery; NHS, National Health Service; NICE, National Institute for Health and Care Excellence; OWSA, one-way sensitivity analysis

Supplementary Text 1: Scenario Analysis

Scenarios were also assessed for below mentioned assumptions, maintaining all the other base-case settings.

Scenario 1: Proportion of eligible population who would receive BaS

In this scenario analysis, we modified only the proportion of the eligible population in the base-case settings (assumed as 10%) for strategy 3.

5% of eligible population who receive BaS over a 20-year time horizon

Over a 20-year time horizon, the prevalent target population size was estimated at 173,943, and the annual incident target population size was estimated at 5,163. The number of BaS procedures (including revision surgery) was projected to increase from 140,220 to 282,371 (revision surgeries: 5.140; incremental: 14,172 BaS). The total annual and 20-year costs were projected to increase to £156.0 million and £3.1 billion, respectively. Scaling up would require an additional full-time 1,251 personnel and 16 new facilities (1 small scale, 15 large scale) dedicated to BaS.

25% of eligible population who receive BaS over a 20-year time horizon

Over a 20-year time horizon, the prevalent target population size was estimated at 869,714, and the annual incident target population size was estimated at 25,815. The number of BaS procedures (including revision surgery) was projected to increase from 140,220 to 1,411,958 (revision surgeries: 25,756; incremental: 1,271,738 BaS). The total annual and 20-year costs were projected to increase to £809.7 million and £16.2 billion, respectively. Scaling up would require an additional full-time 12,576 personnel and 149 new facilities (1 small scale, 148 large scale) dedicated to BaS.

Since the reported prevalence of Type 2 diabetes among BaS eligible patients in the UK ranges from 27% to 31%, this scenario can be interpreted as representing targeting patients with diabetes (39, 40). However, it is important to note that this scenario doesn't capture any additional costs for BaS management that may be specific to patients with diabetes.

100% of eligible population who receive BaS over a 20-year time horizon

Over a 20-year time horizon, the prevalent target population size was estimated at 3,478,854, and the annual incident target population size was estimated at 103,261. The number of BaS procedures (including revision surgery) was projected to increase from 140,220 to 5,647,832 (revision surgeries: 103,065; incremental: 5,507,613 BaS). The total annual and 20-year costs were projected to increase to £3.3 billion and £65.2 billion, respectively. Scaling up would require 55,042 full-time additional personnel and 647 new facilities (1 small scale, 646 large scale) dedicated to BaS.

Scenario 2: Distribution of BaS by type of procedure over 20-year time horizon

In this scenario, the time to achieve 100% distribution of gastric bypass was 10 years, while other base-case settings remain the same.

Gastric bypass at 100%

Over a 20-year time horizon, the number of BaS (including revision surgery) procedures was projected to increase from 140,220 to 569,693 (incremental: 429,473 BaS). The number of gastric bypass, sleeve gastrectomy and gastric band operations was projected to be 484,346, 58,378 and 12,715, respectively. The total annual and 20-years costs were projected to increase to £341.7 million and £6.8 billion, respectively. Scaling up using this scenario would require only 4,518 additional full-time personnel dedicated to BaS over 20 years.

50% of new staff capacity is focused on BaS and it takes 1 year for a facility to be fully functional from the time it's built

Over a 20-year time horizon, the number of BaS procedures (including revision surgery) was projected to increase from 140,220 to 564,783 (incremental: 424,563 BaS). The total annual cost and total 20-year cost were projected to increase to £249.8 million and £5.0 billion, respectively. Scaling up using this scenario would require only 8,177 additional full-time personnel dedicated to BaS.

Scenario 3: Eligible population with BMI ⩾ 40 kg/m^2

Over a 20-year time horizon, with 10% of the eligible population receiving BaS, the prevalent and annual incident target population sizes were estimated at 149,500 and 4,033, respectively and the number of BaS procedures (including revision surgery) was projected to increase from 140,220 to 234,474 (revision surgeries: 4,266; incremental: 94,254). The total annual cost was projected to increase from £70.6 million to £119.6 million. The overall total cost was projected to increase from £1.4 billion to £2.4 billion over 20 years. BaS scale-up would require an additional full-time 681 personnel dedicated to BaS.

Scenario 4: Time horizon

Time horizon of 10 years

This scenario considered the current eligible population but only added new eligible population for 10 years. Over a 10-year time horizon, with 10% eligible population receiving BaS, prevalent and annual incident target population sizes were the same as in the base-case. The number of BaS procedures (including revision surgery) was projected to increase from 70,110 to 459,590 (incremental: 389,480 BaS). The total annual cost and total ten-year cost were projected to

increase to £563.0 million and £5.6 billion, respectively. Scaling up using this scenario would require only 3,730 additional full-time personnel dedicated to BaS.

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Scenario 5: Increased incident rate of obesity (sourced from Cancer Research UK, 2022 (41), estimated based on projected change between 2019 and 2040 for England, i.e. mean of obesity and severe obesity)

Over a 20-year time horizon, with 10% of the eligible population receiving BaS, after increasing the annual incident rate to 3.33%, the prevalent target population size was estimated at 3,478,854, and the annual incident target population size was estimated at 115,846. The number of BaS (including revision surgery) was projected to increase from 140,220 to 590,424 (revision surgeries: 10,763; incremental: 450,204 BaS). The total annual cost and total 20-year cost were projected to increase to £334.2 million and £6.7 billion, respectively.